

4. RESIDENTIAL FACTORS AFFECTING EXPOSURE

Many characteristics of a person's primary residence can contribute to increased exposures to environmental contaminants. This section presents population data for persons residing in homes that have varying characteristics, including the following: age of home; resident's tenure (renter, owner, etc.); housing type (public housing, multiple unit, single-family, mobile home, etc.); type of heating and cooking fuel used; presence of attached garage; use of chemicals for pest control, lawn care, etc.; and presence of recreational pools or spas. Data on these housing characteristics are useful for conducting indoor air risk assessments. For example, in areas with high levels of radon in the soils, build-up of radon gas may become a problem in homes with basements. For homes with attached garages, carbon monoxide from automobile exhaust may be an exposure concern. In addition, chemicals used for pest prevention can pose an indoor air exposure risk to persons living in the homes. Persons living in dilapidated, older housing (built prior to the 1978 lead-based paint ban) or persons renovating such a home may be at increased risk of exposure to lead by deteriorating lead-based paint and the dust it generates. The housing characteristics addressed in this section are presented as useful supplemental data for conducting many types of indoor air quality risk assessments. Other useful data may be found in U.S. EPA (1997), the *Exposure Factors Handbook*, Chapter 11.

4.1. POPULATIONS IN HOMES WITH DIFFERENT CHARACTERISTICS

This section presents population data on persons residing in homes with the varying characteristics listed above.

4.1.1. American Housing Survey for the United States in 1993 (U.S. Bureau of the Census, 1993); Statistical Abstract of the United States (U.S. Bureau of the Census, 1997)

The U.S. Bureau of the Census conducted the American Housing Survey from July through December 1993. About 55,000 personal interviews were conducted nationally. Household information was obtained from occupants of the homes; landlords, rental agents, or knowledgeable neighbors provided information on vacant homes. Results obtained from this

national survey are presented in Tables 4-1 through 4-4. Table 4-1 presents the household composition of occupied housing units. Table 4-2 presents the income characteristics of occupied units. Table 4-3 presents data on construction of housing units and location of units. Table 4-4 presents the number of housing units that use various types of fuels for cooking and heating, which may affect indoor air. Table 4-5 presents housing characteristics (e.g., basements, year built, heating equipment) by tenure and region. Figure 4-1 illustrates the percentage of housing units that are occupied and vacant. Figure 4-2 presents a variety of selected features of occupied housing units.

4.1.2. Screening Young Children for Lead Poisoning (CDC, 1997)

The guidance on childhood lead screening was developed by CDC in consultation with the Advisory Committee on Childhood Lead Poisoning Prevention. Lead-based paint in homes is the most important remaining source of lead exposure for U.S. children. Of all homes built in the United States before 1978, a large amount (83%) still contain some lead-based paint (CDC, 1997). The older the house, the more likely it is to contain lead-based paint and to have a higher concentration of lead in the paint. Housing built before 1950 poses the greatest risk of exposure to children (CDC, 1997). Such housing is present in every State as shown in Table 4-6. The following Department of Housing and Urban Development (HUD) calculation is used to determine the number of affordable housing units that are likely to contain lead-based paint (HUD, 1990):

$$[(\# \text{ units } < 1940 * 0.88) + (\# \text{ units } 1940-1960 * 0.92) + (\# \text{ units } 1961-1980 * 0.76)].$$

4.1.3. National Human Activity Pattern Survey (NHAPS) (Tsang and Klepeis, 1996)

The National Human Activity Pattern Survey (NHAPS), conducted by EPA, is the largest and most current human activity pattern survey available (Tsang and Klepeis, 1996). Data for 9,386 respondents in the 48 contiguous States were collected via minute-by-minute 24-hour diaries between October 1992 and September 1994. The survey collected information on duration and frequency of selected activities. Demographic information was collected for each respondent to allow for statistical summaries to be generated according to specific subgroups of

the U.S. population (e.g., by gender, age, race, employment status, census region, season). The participants' responses were weighted according to geographic, socioeconomic, time/season, and other demographic factors to ensure that results were representative of the U.S. population. The weighted sample matches the 1990 census population for each gender, age group, and census region. In addition, the day-of-week and seasonal responses are distributed equally.

NHAPS data on the time spent in selected activities and the corresponding population participating in these activities are presented in the *Exposure Factors Handbook*, Section 14, Tables 14-19 through 14-92. For example, data are included on the number of persons who spend time either running, walking, standing, or in a vehicle; time spent in indoor and outdoor parking lots and garages; and number of persons working in circumstances where one may come in contact with soil, such as gardening. The reader is referred to the *Handbook* for further information obtained from NHAPS. Advantages of the NHAPS data set are that it is representative of the U.S. population for all ages, genders, and races, and it has been adjusted to be balanced geographically, seasonally, and for day/time. Table 4-7 presents the percentage of the general population living in homes with attached garages. The advantage of NHAPS is that the data were collected for a large number of individuals and are representative of the U.S. general population.

4.2. POPULATIONS WHO USE PESTICIDES AND CHEMICALS FOR LAWN/GARDEN AND POOL/SPA MAINTENANCE

Section 4.2.1 presents the available information on populations using home and garden pesticides and chemicals for lawn/garden and pool/spa maintenance. This information is useful in estimating number of people receiving residential exposure to certain household chemicals, such as insecticides, rodenticides, and fungicides. Section 4.2.2 presents data that can be used to estimate the number of people who might have residential exposure to chlorinated compounds used to treat and disinfect household pools and spas.

4.2.1. National Home and Garden Pesticide Use Survey (Whitmore et al., 1992)

The National Home and Garden Pesticide Use Survey (NHGPUS) was conducted for EPA during August and September 1990. The purpose was to collect data on the use of pesticides in and around homes in the United States. The study was designed as a national probability-based sample of households, with personal interviews conducted at the participants' residence. The target population in the survey was housing units in the conterminous United States occupied as primary residences (home where a person lives for half the year or more), excluding institutions, group quarters, military reservations, and Native American reservations (Whitmore et al., 1992). NHGPUS used the U.S. Bureau of the Census definition of a housing unit as a room or groups of rooms occupied or intended for occupancy as separate living quarters in which the occupants (1) live and eat separately from any other persons in the building and (2) have direct access from the outside of the building or through a common hall. A sample of 2,674 housing units was selected, and 2,447 housing units were eligible for the survey. Individuals representing a total of 2,078 housing units participated in the survey (a response rate of 84.9 percent) and provided information on frequency and types of pesticide use and where and how they were used. Because of the high response rate, the potential for nonresponse bias is low (Whitmore, et al., 1992). NHGPUS is based on a sample of 29 States and 60 counties. Tables 4-8, 4-9, and 4-10 present data collected in NHGPUS. An assessor can develop numerical estimates of potential exposed populations by multiplying the number of households presented in Tables 4-8 thru 4-12 by 2.65 persons/household as provided in the Bureau of Census (1997). Table 4-8 presents the selected characteristics of households in the target population, including urbanization, type of housing, private lawn and swimming pool present, and hot tub present. Table 4-9 presents the number of households that used pest control services and received written precautions in the year preceding the survey. Table 4-10 presents the number of households reporting major pest problems or experiencing pest problems that were treated by a household member in the previous year. Table 4-11 also presents number of households where pesticides were not stored securely and had children <5 years old living there. Table 4-12 provides information on the number of households using pesticides by type of pesticide and site of

application. Table 4-13 presents estimated percentage of households using pesticides by type of pesticide and site of application.

4.2.2. 1993 Pool and Spa Market Study (National Spa and Pool Institute, 1993)

The National Spa and Pool Institute (NSPI) is a trade association that provides market data to its members. The statistical information provided by NSPI in Tables 4-14 and 4-15 is an overview and was extrapolated from the National Spa and Pool Institute Pool and Spa Market Study. This publication is available from NSPI Publications (703) 838-0083 for \$250.

The overview data are based on a household consumer survey. NSPI maintains a data base of households in selected U.S. geographic regions. Households were randomly selected, and the data were collected through mail surveys. From a total of 90,000 surveys mailed, 65,000 individuals responded: a response rate of 72%. Table 4-14 presents data for owners of residential pools, and Table 4-15 presents data for owners of residential spas. These data are presented by pool ownership. However, populations using pools/spas may be estimated conservatively by assuming one pool/spa per household and multiplying by the average number of persons per household using the U.S. Bureau of the Census data (2.65 persons/household in 1996) or by multiplying by number of persons per State, presented in Table 2-9.

4.3. REFERENCES

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Table 4-3 Goes Here

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Table 4-5. Housing Units--Characteristics, by Tenure and Region
 [In thousands of units, except as indicated.
 As of Oct. 1. Based on the American Housing Survey]

CHARACTERISTIC	YEAR-ROUND UNITS									Vacant
	Total housing units	Seasonal	Occupied							
			Total	Owner	Renter	Northeast	Midwest	South	West	
Total units	109,457	3,054	97,693	63,544	34,150	19,200	23,662	34,236	20,596	8,710
Percent distribution	100.0	2.8	89.3	58.1	31.2	17.5	21.6	31.3	18.8	8.0
Units in structure:										
Single family detached	66,169	1,804	60,826	52,257	8,569	9,818	16,175	22,406	12,427	3,539
Single family attached	6,213	41	5,545	2,936	2,609	1,571	1,053	1,867	1,055	627
2-4 units	10,700	124	9,299	1,734	7,565	3,126	2,168	2,083	1,922	1,277
5-9 units	5,594	102	4,803	520	4,283	970	1,023	1,592	1,218	690
10-19 units	5,092	93	4,342	368	3,974	791	880	1,575	1,096	657
20-49 units	3,901	74	3,244	342	2,903	896	559	856	933	583
50 or more units	4,140	55	3,470	550	2,920	1,470	668	641	691	615
Mobile home or trailer	7,647	761	6,164	4,837	1,328	557	1,136	3,216	1,254	722
Stories in structure: \1										
One story	3,065	35	2,678	279	2,399	158	374	1,204	942	352
2 stories	10,828	149	9,318	1,055	8,263	1,065	1,321	3,594	3,338	1,361
3 stories	8,268	152	7,056	1,179	5,877	2,363	2,451	1,249	992	1,060
4-6 stories	4,652	79	3,904	591	3,312	2,287	793	395	429	670
7 or more stories	2,627	32	2,213	415	1,799	1,382	359	312	160	381
Foundation: \2										
Full or partial basement	32,423	367	30,635	27,080	3,554	9,859	13,077	4,894	2,803	1,420
Crawlspace	18,891	762	16,727	13,155	3,572	573	2,413	9,007	4,735	1,402
Concrete slab	19,255	358	17,722	13,988	3,734	855	1,556	9,610	5,702	1,175
Other	1,813	358	1,287	970	317	101	181	762	243	168
Year structure built:										
1939 and earlier	22,116	544	19,308	11,068	8,239	7,162	6,228	3,574	2,345	2,263
1940 to 1949	8,400	228	7,487	4,671	2,817	1,680	1,750	2,500	1,558	685
1950 to 1959	13,569	371	12,398	8,798	3,600	2,546	3,245	3,936	2,670	800
1960 to 1969	15,806	472	14,267	9,349	4,918	2,415	3,266	5,286	3,300	1,068
1970 to 1979	23,717	784	21,033	13,347	7,685	2,716	4,872	8,358	5,086	1,899
1980 or later	25,849	654	23,201	16,311	6,890	2,679	4,301	10,582	5,639	1,994
Median year	1967	1968	1967	1968	1965	1953	1962	1972	1971	1966
Main heating equipment:										
Warm-air furnace	57,840	838	53,165	38,301	14,863	6,881	17,711	17,212	11,361	3,837
Electric heat pump	10,614	311	9,406	7,027	2,379	433	692	7,003	1,278	897
Steam or hot water system	14,895	87	13,669	7,323	6,345	9,503	2,587	834	745	1,139
Floor, wall, or pipeless furnace	5,674	128	4,963	2,148	2,815	234	389	1,534	2,806	583
Built-in electric units	8,344	422	7,035	2,870	4,166	1,303	1,342	2,286	2,104	887
Room heaters with flue	2,083	178	1,620	869	752	187	245	864	324	285
Room heaters without flue	1,886	49	1,642	964	678	43	31	1,500	69	194
Stoves	2,877	339	2,320	1,735	585	360	379	962	619	218
Fireplaces	1,066	141	850	661	187	37	81	385	347	75
None	1,795	359	1,044	463	581	38	31	457	518	393
Portable elec. heaters	950	78	809	413	395	19	18	576	195	63
Other	1,432	124	1,171	768	403	162	156	623	231	137
Kitchen equipment:										
Lacking complete facilities	3,629	391	1,075	461	614	241	281	302	252	2,163
With complete facilities	105,827	2,662	96,618	63,083	33,536	18,959	23,382	33,934	20,344	6,546
Kitchen sink	108,395	2,903	97,034	63,231	33,803	19,033	23,484	34,065	20,452	8,458
Refrigerator	106,872	2,739	97,433	63,469	33,964	19,133	23,597	34,180	20,523	6,701
Burners and oven	107,394	2,795	97,207	63,443	33,764	19,093	23,528	34,113	20,473	7,392
Burners only	151	21	105	31	74	28	17	40	20	25
Oven only	119	4	99	32	68	14	44	19	22	16
Dishwasher	56,635	818	52,508	40,236	12,272	9,084	11,160	19,210	13,054	3,309
Washing machine	79,403	1,129	75,745	60,034	15,711	13,526	18,804	28,015	15,399	2,530
Clothes dryer	74,165	1,062	70,756	57,184	13,571	12,150	18,341	25,694	14,571	2,347
Disposal in kitchen sink	46,353	717	42,451	28,793	13,659	4,159	10,301	14,086	13,906	3,185
Air conditioning:										
Percent of total units	50,824	780	46,577	34,161	12,415	3,856	11,694	23,772	7,255	3,467
One or more room units	46.4	25.5	47.7	53.8	36.4	20.1	49.4	69.4	35.2	39.8
Source of water:										
Public system or private company	29,141	530	27,181	16,126	11,054	8,732	7,107	8,361	2,982	1,431
Percent of total units	94,108	1,767	84,818	52,643	32,175	16,307	19,749	29,445	19,318	7,523
Well serving 1 to 5 units	86.0	57.9	86.8	82.8	94.2	84.9	83.5	86.0	93.8	86.4
Other	14,265	955	12,270	10,463	1,807	2,783	3,778	4,498	1,211	1,041
Other	1,083	332	606	438	167	110	136	293	67	146
Means of sewage disposal:										
Public sewer	83,308	1,222	75,282	44,527	30,755	14,859	18,618	24,111	17,694	6,804
Percent of total units	76.1	40.0	77.1	70.1	90.1	77.4	78.7	70.4	85.9	78.1
Septic tank, cesspool, chemical toilet	25,635	1,521	22,296	18,937	3,359	4,335	5,029	10,041	2,891	1,819
Other	513	311	116	80	36	6	15	83	11	87

\1 Limited to multiunit structures. Includes some multi-unit mobile homes.

\2 Limited to single-family units.

Source: U.S. Bureau of the Census, Current Housing Reports, series, H150/93, and H150/95 American Housing Survey in the United States.

Figure 4-1 goes here

Figure 4-2 goes here

Table 4-6. Percentage of U.S. Housing Built Before 1950 and from 1970-1979^b, by State

State	Total Housing Units	Built Before ^a 1950 (%)	Built ^b 1970 to 1979 (%)
United States	102,263,678	26.9	21.8
Alabama	1,670,379	17.9	25.5
Alaska	232,608	7.0	32.7
Arizona	1,659,430	6.7	30.7
Arkansas	1,000,667	17.7	27.8
California	11,182,882	19.8	21.7
Colorado	1,477,349	18.3	28.9
Connecticut	1,320,850	35.0	15.7
Delaware	289,919	22.3	20.2
District of Columbia	278,489	55.7	8.4
Florida	6,100,262	7.7	29.3
Georgia	2,638,418	14.5	24.5
Hawaii	389,810	13.4	30.5
Idaho	413,327	24.4	32.4
Illinois	4,506,275	36.9	18.4
Indiana	2,246,046	33.7	20.2
Iowa	1,143,669	42.9	20.2
Kansas	1,044,112	33.1	20.3
Kentucky	1,506,845	24.2	25.0
Louisiana	1,716,241	19.5	25.3
Maine	587,045	41.1	19.8
Maryland	1,891,917	25.1	19.6
Massachusetts	2,472,711	46.8	14.1
Michigan	3,847,926	31.9	20.4
Minnesota	1,848,45	31.7	22.1
Mississippi	1,010,423	16.6	27.5
Missouri	2,199,129	28.6	21.5
Montana	361,155	30.1	26.6
Nebraska	660,621	37.8	22.1
Nevada	518,858	6.0	30.5
New Hampshire	503,904	32.2	20.5
New Jersey	3,075,310	35.2	14.9
New Mexico	632,058	15.5	26.5
New York	7,226,891	47.1	11.9
North Carolina	2,818,193	17.6	24.3
North Dakota	276,340	30.8	26.6
Ohio	4,371,945	35.7	18.6
Oklahoma	1,406,499	21.2	25.4
Oregon	1,193,567	26.5	28.7
Pennsylvania	4,938,140	44.8	15.8
Rhode Island	414,572	43.7	14.7
South Carolina	1,424,155	15.4	26.3
South Dakota	292,436	36.7	24.6
Tennessee	2,026,067	18.8	24.8
Texas	7,008,999	14.4	25.9
Utah	598,388	21.3	28.1
Vermont	271,214	40.5	19.6
Virginia	2,496,334	19.3	23.6
Washington	2,032,378	24.6	24.6
West Virginia	781,295	34.6	22.8
Wisconsin	2,055,774	36.8	21.1
Wyoming	203,411	23.7	31.1

Sources: (a) CDC, 1997; (b) U.S. Bureau of the Census, 1997.

Table 4-7. Percentage of Respondents With Attached Garages or Carports

	ND		NO		YES		DK	
	ALL N	Respondants N %						
Overall	9386	1933 20.6	3693 39.3	3669 39.1	91 1.0			
Gender								
Male	4294	861 20.1	1671 38.9	1724 40.1	38 0.9			
Female	5088	1072 21.1	2018 39.7	1945 38.2	53 1.0			
Age								
1-4	187	35 18.7	76 40.6	46 24.6	30 16.0			
5-11	499	99 19.8	193 38.7	204 40.9	3 0.6			
12-17	703	91 12.9	308 43.8	303 43.1	1 0.1			
18-64	589	51 8.7	257 43.6	281 47.7	ND ND			
> 64	6059	1399 23.1	2300 38.0	2322 38.3	38 0.6			
	1349	258 19.1	559 41.4	513 38.0	19 1.4			
Race								
White	126	17 13.5	47 37.3	18 14.3	44 34.9			
Black	7591	1381 18.2	3014 39.7	3162 41.7	34 0.4			
Asian	945	320 33.9	392 41.5	224 23.7	9 1.0			
Some Other	157	47 29.9	36 22.9	73 46.5	1 0.6			
Hispanic	182	52 28.6	67 36.8	60 33.0	3 1.6			
	385	116 30.1	137 35.6	132 34.3	ND ND			
Hispanic								
No	103	10 9.7	33 32.0	14 13.6	46 44.7			
Yes	8531	1725 20.2	3383 39.7	3382 39.6	41 0.5			
DK	705	187 26.5	258 36.6	256 36.3	4 0.6			
	47	11 23.4	19 40.4	17 36.2	ND ND			
Employment								
Full Time	1844	249 13.5	770 41.8	792 43.0	33 1.8			
Part Time	4096	933 22.8	1528 37.3	1613 39.4	22 0.5			
Not Employed	802	181 22.6	320 39.9	295 36.8	6 0.7			
	2644	570 21.6	1075 40.7	969 36.6	30 1.1			
Education								
< High School	1968	256 13.0	827 42.0	829 42.1	56 2.8			
High School Grad.	834	165 19.8	449 53.8	213 25.5	7 0.8			
< College	2612	541 20.7	1159 44.4	896 34.3	16 0.6			
College Grad.	1801	438 24.3	596 33.1	760 42.2	7 0.4			
Post Grad.	1247	321 25.7	386 31.0	536 43.0	4 0.3			
	924	212 22.9	276 29.9	435 47.1	1 0.1			
Census Region								
Northeast	2075	590 28.4	863 41.6	603 29.1	19 0.9			
Midwest	2102	372 17.7	865 41.2	846 40.2	19 0.9			
South	3243	530 16.3	1376 42.4	1303 40.2	34 1.0			
West	1966	441 22.4	589 30.0	917 46.6	19 1.0			
Day of Week								
Weekday	6316	1290 20.4	2490 39.4	2476 39.2	60 0.9			
Weekend	3070	643 20.9	1203 39.2	1193 38.9	31 1.0			
Season								
Winter	2524	504 20.0	986 39.1	1003 39.7	31 1.2			
Spring	2438	487 20.0	977 40.1	953 39.1	21 0.9			
Summer	2536	533 21.0	1004 39.6	973 38.4	26 1.0			
Fall	1888	409 21.7	726 38.5	740 39.2	13 0.7			
Asthma								
No	8629	1765 20.5	3416 39.6	3399 39.4	49 0.6			
Yes	694	161 23.2	266 38.3	265 38.2	2 0.3			
DK	63	7 11.1	11 17.5	5 7.9	40 63.5			
Angina								
No	9061	1862 20.5	3566 39.4	3584 39.6	49 0.5			
Yes	250	61 24.4	109 43.6	79 31.6	1 0.4			
DK	75	10 13.3	18 24.0	6 8.0	41 54.7			
Bronchitis / emphysema								
No	8882	1807 20.3	3516 39.6	3510 39.5	49 0.6			
Yes	433	118 27.3	162 37.4	153 35.3	Nd nd			
DK	71	8 11.3	15 21.1	6 8.5	42 59.2			

Note: ND = Missing data; DK = Don't know; % = Row percentage; N = Sample size

Source: Tsang and Klepeis, 1996.

Table 4-8. Selected Characteristics of Households in the Target Population

Population Characteristic	Estimated Thousands of Households	Estimated Percentage of All Households
All households	84,573	100.00
Urbanization ^a		
Urban	70,468	83.32
Rural	14,105	16.68
Type of dwelling		
Single-family	63,335	74.89
Multi-family	21,237	25.11
Have private lawn		
Yes	66,828	79.02
No	17,744	20.98
Have private swimming pool		
Yes	5,978	7.07
No	78,595	92.93
Have hot tub		
Yes	2,500	2.96
No	82,073	97.04
Grew edible fruit/nut trees or grape vines	18,421	21.78
Yes	66,151	78.22
No		
Grew tomatoes, vegetables, berries, or melons in past year ^b		
Yes	23,180	27.41
No	61,392	72.59
Grew roses in the past year ^b		
Yes	27,150	32.10
No	57,423	67.90

^a The interviewers were instructed to classify each residence as located in either an urban area or a rural area in their best judgment so that homes in suburban neighborhoods located adjacent to rural farmland would be coded as urban, while farm homes would be coded as rural.

^b Excluding any grown for sale.

Source: Whitmore et al., 1992.

Table 4-9. Number of Households That Used Pest Control Services and Received Written Precautions in the Previous Year

Type of Service/ Utilization/ Written Precautions	Estimated Thousands of Households	Estimated Percentage of Households
Commercial Lawn-Care Company Utilized ^a	8,003	12.07
Informed of Chemicals Used ^c	3,626	59.51
Informed of Safety Precautions ^c	3,746	50.42
Treatment for Fleas, Roaches, Ants Utilized ^b	16,557	19.58
Informed of Chemicals Used ^c	3,637	23.46
Informed of Safety Precautions ^c	3,216	20.67

^a The inference population for lawn care services is the population of all households with a private lawn.

^b The inference population for treatment of fleas, roaches, or ants is the population of all private households.

^c Conditional percentages, given that the service was used.

Source: Whitmore et al., 1992.

Table 4-10. Households Reporting Major Pest Problems or Problems Treated by a Household Member

Pest Problem	Households Reporting Major Problem		Households Reporting Treated Problem		Most Frequently Treated Sites ^a (in order of treatment frequency)
	Estimated Thousands of HH	Estimated Percentage of All HH	Estimated Thousands of HH	Estimated Percentage of All HH	
Microorganisms					
Mildew, mold, bacteria, virus	2,486	2.94	40,361	47.72	Bathroom; kitchen; living area; fabric
Plant diseases	1,826	2.16	8,356	9.88	Roses; ornamentals ^b ; lawn; garden ^c
Insects and Related Pests					
Ants ^d	10,830	12.81	30,443	36.00	Kitchen; OOA; bathroom; OIA
Mosquitoes	6,884	8.14	24,056	28.44	Person; OOA; living area; kitchen
Cockroaches	8,320	9.84	20,687	24.46	Kitchen; bathroom; living area; OIA
Fleas	6,482	7.66	20,107	23.77	Cat, dog or kennel; living area; kitchen; bathroom
Flies, gnats, midges	4,961	5.87	17,448	20.63	Person; kitchen; OOA; living area
Bees, hornets, wasps	4,995	5.91	15,611	18.46	OOA; OIA; detached structures; living area
Spiders, crickets, pillbugs, milli/centipedes	5,105	6.04	13,177	15.58	OOA; OIA; kitchen; living area
Plant-chewing insects	3,468	4.10	11,858	14.02	Ornamentals ^b ; garden ^c ; roses; lawn
Plant-sucking insects and mites	2,994	3.54	11,730	13.87	Ornamentals ^b ; roses; garden ^c ; lawn
Ticks, chiggers	1,659	1.96	9,542	11.28	Cat, dog or kennel; person; lawn; OOA
Fire ants	4,966	5.87	7,907	9.35	Lawn; OOA; kitchen; OIA
Mice, rats	2,571	3.04	7,388	8.74	Kitchen; OIA; bathroom; living area
Slugs, snails	2,076	2.45	5,100	6.03	Ornamentals ^b ; lawn; OOA ^b ; garden ^c
Plants					
Broadleaf weeds	3,692	4.37	12,345	14.60	Lawn; OOA; ornamentals ^b ; garden ^c
Grass-like weeds	3,158	3.73	11,707	13.84	Lawn; OOA; ornamentals ^b ; roses

Abbreviations: HH = households; OOA = other outside area (such as walls, driveway, patio, deck, fences, or roof, including air treated by fogging);
OIA = other inside area (such as attached garage, attic, basement, crawlspace, attached utility room or workshop).

^a "Treated" or "not treated" refers to treatment by a household member; thus, pests treated only by a pest control service are reported as "not treated" in this table.

^b Roses are the only ornamental identified separately.

^c Food crops such as tomatoes and vegetables (excluding fruit or nut trees and grapes).

^d Excluding fire ants, carpenter ants, and termites.

Source: Whitmore et al., 1992.

Table 4-11. Number of Households with at Least One Pesticide Product Stored Insecurely by Type of Pesticide for Households with Children under 5 Years of Age^a

Type of Pesticide	At Least One Stored Insecurely		TOTAL	
	Estimated Thousands of HH	Estimated Percentage ^b of HH	Estimated Thousands of HH	Estimated Percent ^b of HH
All Types of Pesticides	6,078 ^c	46.88	12,965 ^c	100.00
Disinfectant	3,481	41.61	8,366	100.00
Fungicide	2,831	38.12	7,425	100.00
Insecticide	3,740	36.04	10,404	100.00
Molluscicide	43 ^d	6.45 ^d	660	100.00
Rodenticide	319 ^d	40.65	786	100.00
Herbicide	617	21.18	2,912	100.00
Repellent	1,261	24.30	5,189	100.00

Abbreviations: HH = Households.

^a For pesticide products (excluding those used exclusively for agricultural production, plant growth regulators, pool chemicals, and anti-fouling paints) in storage at residences in the target population at the time of the survey (Aug-Sept 1990).

^b Conditional percentage, given that at least one product of the designated type was in storage.

^c An individual pesticide product can be of more than one type (e.g., insecticide and fungicide). Therefore, the estimates for the individual types of pesticides sum to more than the total for all types of pesticides.

^d Estimate has poor precision because of the small number of observations in this cell.

Source: Whitmore et al., 1992.

Table 4-12. Estimated Thousands of Households Using Pesticides by Type of Pesticide and Site of Application^a

Type of Pesticide	Site of Application					All Sites
	Indoors	Lawn	Food Crops	Ornamentals	Others	
	Estimated Thousands of Households (Standard Error in Parentheses)					
Fungicide	31,952 ^b (2,642)	980 (270)	2,203 (296)	4,361 (613)	1,703 (309)	35,501 (2,606)
Insecticide	41,597 (1,943)	11,951 (1,067)	7,084 (734)	11,908 (1,033)	20,800 (1,488)	52,367 (2,383)
Molluscicide	0 ^c (0)	1,098 (388)	969 (197)	2,373 (365)	936 (208)	3,591 (438)
Rodenticide	2,936 (488)	461 (147)	76 ^d (55)	81 ^d (57)	454 (136)	3,488 (448)
Herbicide	1,199 ^e (311)	9,598 (1,083)	691 (167)	1,719 (324)	5,607 (598)	14,032 (1,265)
All the Above	57,245 (2,538)	17,882 (1,472)	8,048 (722)	13,464 (1,113)	24,054 (1,600)	64,250 (2,661)
Disinfectant	40,039 (2,819)	44 ^d (44)	0 ^c (0)	150 ^d (116)	1,236 (268)	40,291 (2,853)
Repellent	15,183 (1,087)	1,181 (250)	77 ^d (56)	514 (153)	2,132 (389)	17,066 (1,179)
All Types of Pesticides	63,716 (2,599)	18,432 (1,461)	8,086 (716)	13,662 (1,104)	24,647 (1,651)	69,018 (2,732)

^a For pesticide products (excluding those used exclusively for agricultural production, plant growth regulators, pool chemicals, and anti-fouling paints) in storage at residences in the target population at the time of the survey (Aug-Sept 1990).

^b Bleach, cleaning products, and humidifier products classified as fungicides in EPA's Master Product Label File.

^c None reported in the survey.

^d Estimate has poor precision (RSE > 50%).

^e Bleach, cleaning products, and humidifier products classified as algaecides in EPA's Master Product Label File.

Source: Whitmore et al., 1992.

Table 4-13. Estimated Percentage of Households Using Pesticides by Type of Pesticide and Site of Application^a

Type of Pesticide	Site of Application					All Sites
	Indoors	Lawn	Food Crops	Ornamentals	Others	
	Estimated Percentage of Households (Standard Error in Parentheses)					
Fungicide	37.78 ^b (2.97)	1.16 (0.30)	2.61 (0.35)	5.16 (0.74)	2.01 (0.39)	41.98 (2.84)
Insecticide	49.19 (1.74)	14.13 (1.15)	8.38 (0.79)	14.08 (1.25)	24.59 (1.71)	61.92 (1.90)
Molluscicide	0.00 ^c (0.00)	1.30 (0.44)	1.15 (0.23)	2.81 (0.47)	1.11 (0.26)	4.25 (0.53)
Rodenticide	3.47 (0.52)	0.54 (0.18)	0.09 ^d (0.07)	0.10 ^d (0.07)	0.54 (0.16)	4.12 (0.51)
Herbicide	1.42 ^e (0.38)	11.35 (1.26)	0.82 (0.20)	2.03 (0.41)	6.63 (0.75)	16.59 (1.51)
All the Above	67.69 (1.87)	21.14 (1.63)	9.52 (0.77)	15.92 (1.37)	28.44 (1.90)	75.97 (1.51)
Disinfectant	47.34 (3.11)	0.05 ^d (0.05)	0.00 ^c (0.00)	0.18 ^d (0.14)	1.46 (0.33)	47.64 (3.16)
Repellent	17.95 (1.30)	1.40 (0.31)	0.09 ^d (0.07)	0.61 (0.18)	2.52 (0.47)	20.18 (1.43)
All Types of Pesticides	75.34 (1.72)	21.79 (1.65)	9.56 (0.77)	16.15 (1.35)	29.14 (1.98)	81.61 (1.48)

- ^a For pesticide products (excluding those used exclusively for agricultural production, plant growth regulators, pool chemicals, and anti-fouling paints) in storage at residences in the target population at the time of the survey (Aug-Sept 1990).
- ^b Bleach, cleaning products, and humidifier products classified as fungicides in EPA's Master Product Label File.
- ^c None reported in the survey.
- ^d Estimate has poor precision (RSE > 50%).
- ^e Bleach, cleaning products, and humidifier products classified as algaecides in EPA's Master Product Label File.

Source: Whitmore et al., 1992

Table 4-14. Residential Pool Ownership in the Continental United States

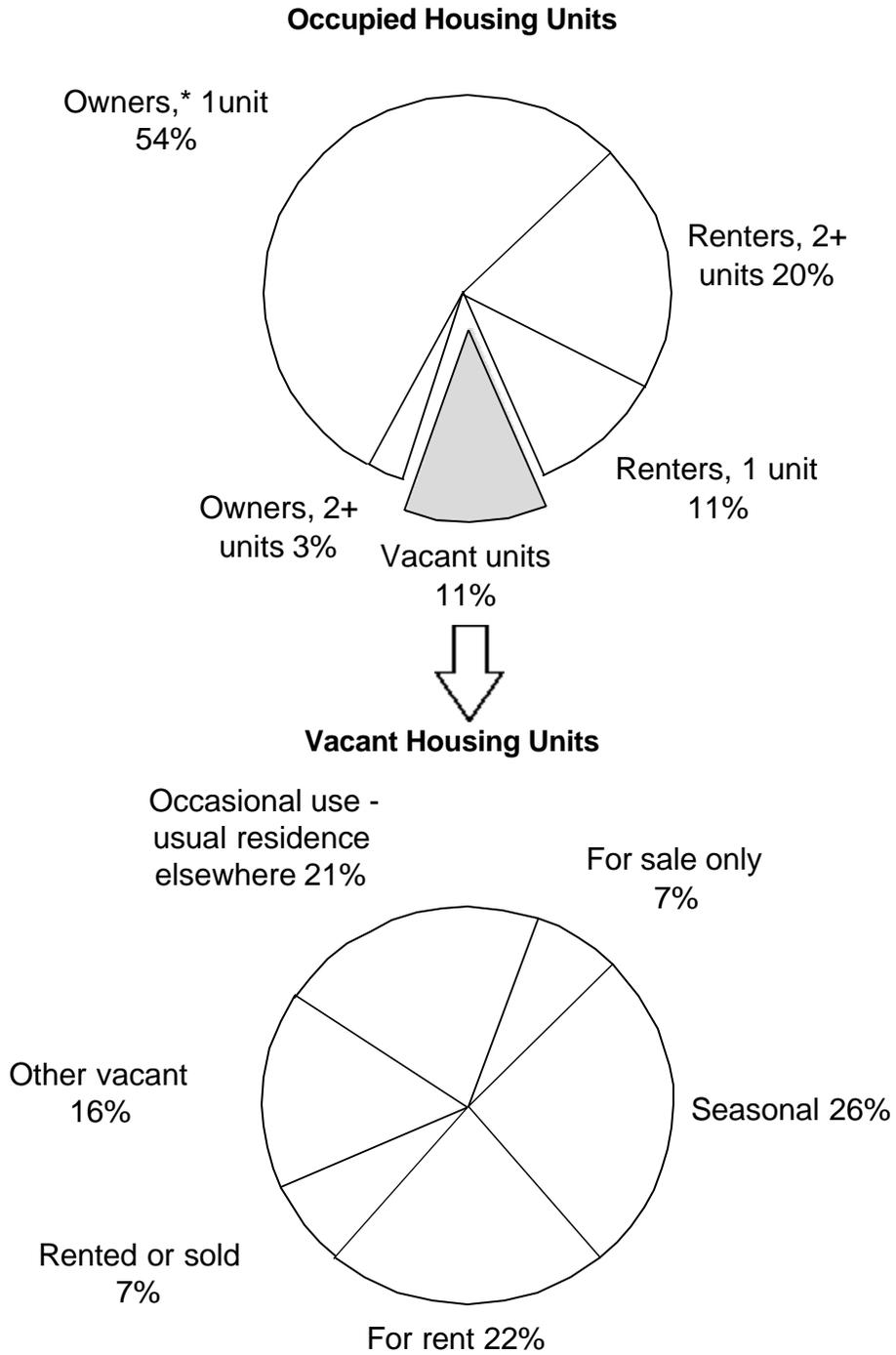
	In-ground	Above-ground	Total Owned
Pool Ownership, Continental U.S.	3.4 million	3.2 million	6.6 million
In-ground Pool Ownership, Top 10 States			
California	818,000	---	
Florida	640,000	---	
Texas	228,000	---	
Arizona	183,000	---	
New York	170,000	---	
New Jersey	134,000	---	
Pennsylvania	103,000	---	
Massachusetts	82,000	---	
Ohio	76,000	---	
Georgia	71,000	---	
Above-ground Pool Ownership			
New York	---	468,000	
Pennsylvania	---	288,000	
California	---	229,000	
New Jersey	---	199,000	
Illinois	---	151,000	
Michigan	---	146,000	
Florida	---	145,000	
Massachusetts	---	139,000	
Ohio	---	133,000	
Texas	---	116,000	
Demographics			
Average Yearly Household Income	\$67,000	\$46,000	
Average Age: Male Head of Household	49 years	44 years	
Average Age: Female Head of Household	48 years	42 years	
Average Length of Ownership	10.4 years	7.0 years	

Source: National Spa and Pool Institute, 1993.

Table 4-15. Residential Spa Ownership in the Continental United States

		Total Owned
Spa Ownership, Continental U.S.		3.3 million
Spa Ownership, Top 10 States		
California		1,127,000
Florida		293,000
Texas		270,000
Washington		150,000
Oregon		91,000
Arizona		88,000
Michigan		85,000
Pennsylvania		77,000
New York		65,000
Nevada		63,000
Demographics		
Average Yearly Household Income	\$67,000	
Average Age: Male Head of Household	47 years	
Average Age: Female Head of Household	45 years	
44% have children at home		
40% are families/couples without children		

Source: National Spa and Pool Institute, 1993.



* Includes mobile homes.

Figure 4-1. Percentage of occupied and vacant housing units.

Source: U.S. Bureau of the Census, 1993.

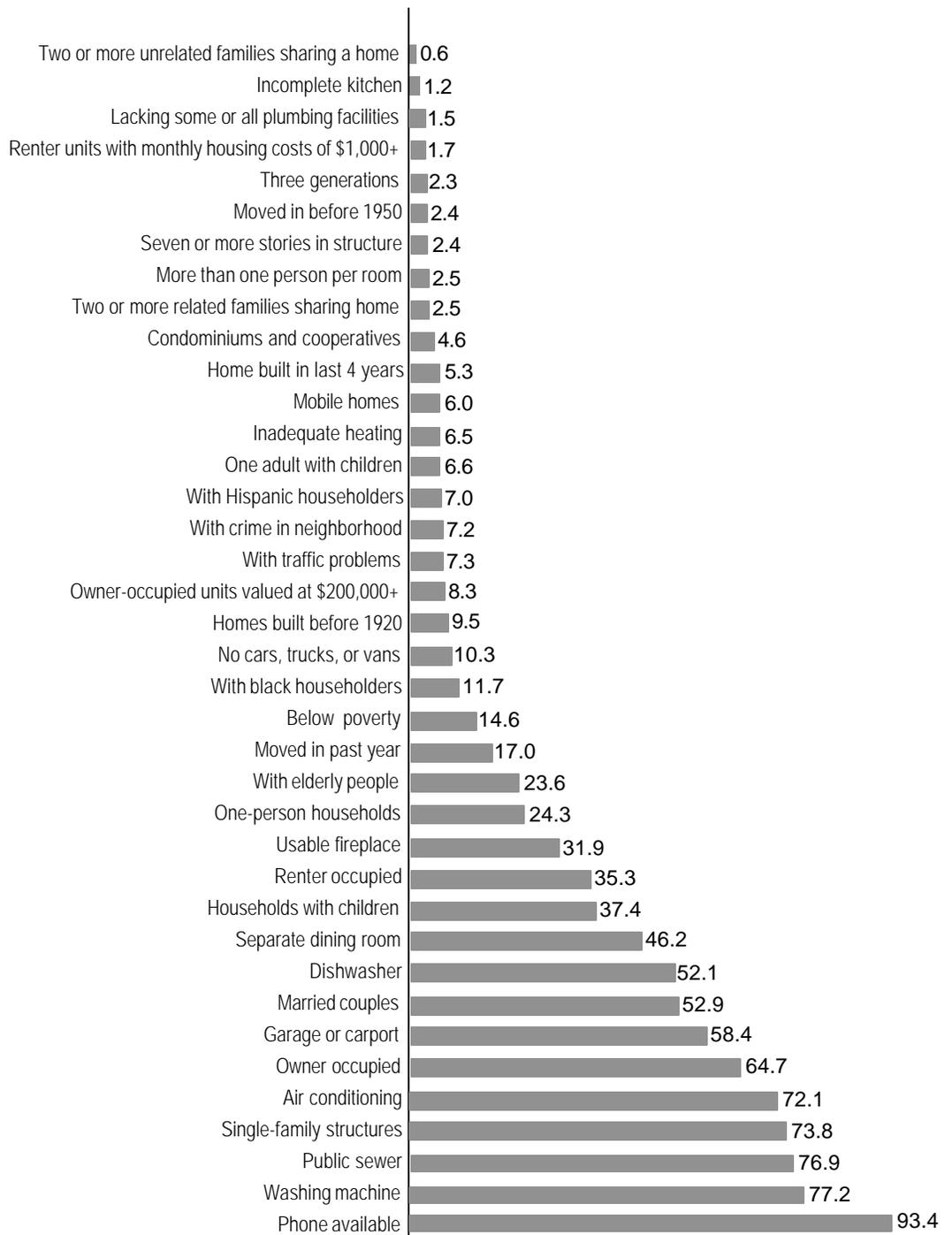


Figure 4-2. Selected Features of Occupied Homes: 1993 (Percent of Occupied Units)

Source: U.S. Bureau of the Census, 1993.